

## Midyear Exam Review 2009-2010

### COURSE: Algebra & Geometry II

#### **Learning Goals:**

By the end of Semester One, students should be able to:

#### **Unit 1**

1. Create equations to model linear data.
2. Solve linear equations for one variable in terms of another including solving for slope-intercept form.
3. Graph linear equations.
4. Write systems of linear equations.
5. Solve systems of linear equations by graphing, substitution, and elimination.
6. Recognize linear systems with no solution or infinitely many solutions.

#### **Unit 3**

1. Use coordinates to represent triangles and quadrilaterals.
2. Determine the distance between two points in a plane, the slope of the segment connecting those points, and the midpoint.
3. Prove properties of coordinate representations of triangles and quadrilaterals, specifically whether sides are parallel, perpendicular, and how lengths of sides compare.
4. Use these proven properties to identify special types of quadrilaterals.
5. Complete rigid transformations of points in the coordinate plane, specifically i) translations, ii) reflections about either axis or about the lines  $y=x$  or  $y=-x$ , iii) rotations in increments of  $90^\circ$ .
6. Similarity transformations by dilating by a scale factor (size transformations).

#### **Supplements- Operating with Powers; Square Roots & Radicals**

1. Use properties of exponents, including negative and fractional exponents, to simplify expressions.
2. Write expressions in simplest radical form.
3. Use properties of special right triangles (45-45-90 and 30-60-90) to solve problems.

#### **Unit 7 (Course 1)**

1. Write equations to model the height of an object at any time given its initial height and velocity
2. Solve application problems involving quadratic equations (height)
3. Use tables and graphs to estimate solutions to quadratic equations
4. Use the graphing calculator to find solutions to quadratic equations ( $2^{\text{nd}}$ , trace)

#### **PLEASE NOTE:**

*Students may make a toolkit card on one 3" x 5" index card to highlight information including formulas, diagrams, or definitions that they choose to put on the card. Each student must make his/her own card. It must be made prior to the exam and handed in with the exam. Toolkit cards may not be used on semester exams in Honors Level classes.*

*Review packets must be handed in prior to taking the exam.*

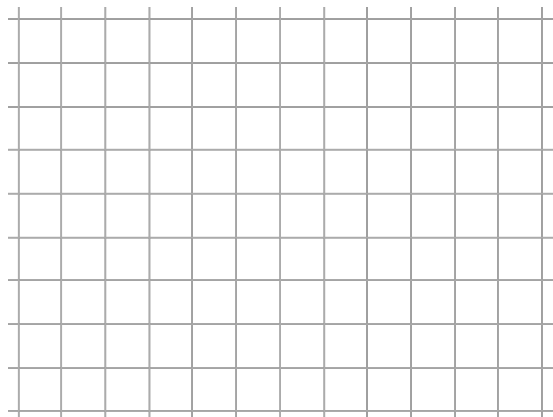
**ITEM ANALYSIS SHEET****COURSE: Algebra & Geometry II**

<i>Question</i>	<i>Question Type</i>	<i>Point Value</i>	<i>Unit</i>
<b>1</b>			
<b>2</b>			
<b>3</b>			
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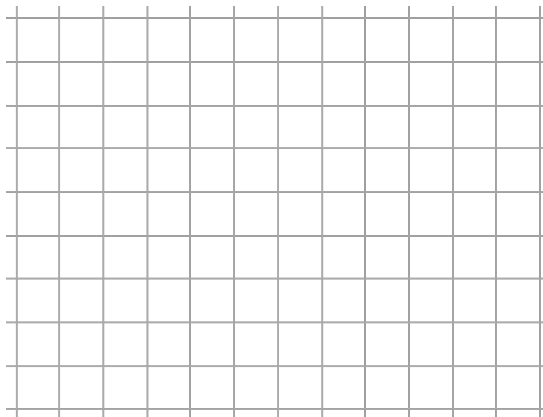
*Please Note: The order of questions listed here may not be the order of the questions on you exam.*

1. **Without** using your calculator, sketch graphs for each of the following equations. Be sure to label each axis and your scale.

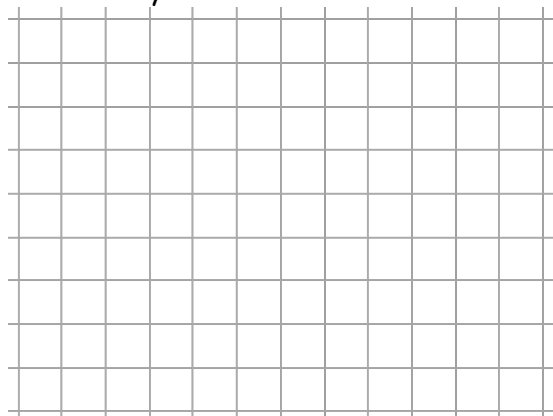
a.  $y = 2x - 4$



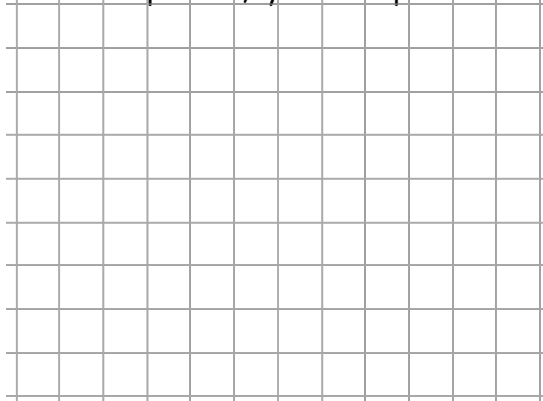
b.  $y = -\frac{2}{3}x + 3$



c.  $y = x$



d. slope = -2, y-intercept = 1



2. For a team fundraiser, the hockey team sold hats for \$15 each and t-shirts for \$20 each. They had a goal of \$600. Use T to represent the number of t-shirts sold and H to represent the number of hats sold.

- Write an equation using the variables H and T that shows how many of each they might sell to exactly reach their goal.
- If they sell *only* T-shirts, how many must they sell to reach the goal?
- If they sell 24 T-shirts, how many hats must they sell to exactly reach the goal?

3. Given  $5x + 2y = 20$ :

a. Solve for  $y$  in terms of  $x$ :

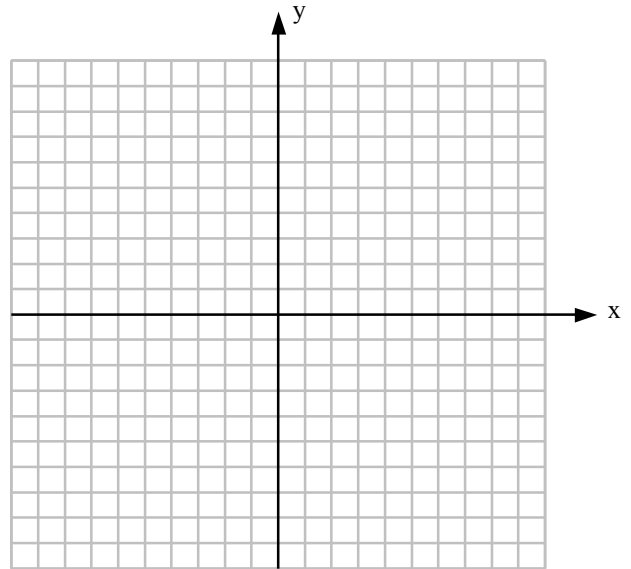
b. Solve for  $x$  in terms of  $y$ :

c. Indicate the slope and  $y$ -intercept: slope = \_\_\_\_\_  $y$ -intercept = \_\_\_\_\_

4. Graph the following equation:  $8x - 4y = 4$

a. Draw a line perpendicular to  $8x - 4y = 4$  that passes through  $(0, 3)$ .

b. Write the equation of the perpendicular line you drew in part a.



5. Write two equations that are parallel to each other. Explain how you know they are parallel.

6. Write two equations that are perpendicular to each other. Explain how you know they are perpendicular.

7. What does it mean to "solve a system of equations"? And how many different methods are there to solve a system? List all that we have learned this year.

8. Solve the following system using **Substitution**. Show all work.

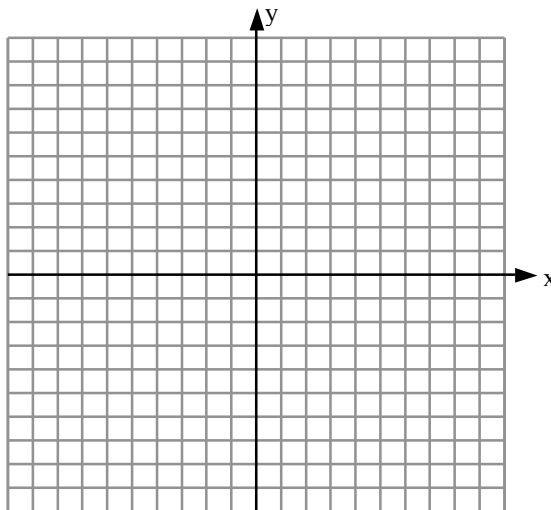
$$-2x + 3y = 18$$

$$x = 40 - 2y$$

9. Solve the following system of equations by **Graphing**. Remember to write the solution to the system as an *ordered pair*.

$$-2x + y = 3$$

$$-4x + y = 7$$



10. At the zoo, Terri paid \$4.80 for 2 slices of veggie pizza and 2 small lemonades. Jay bought 3 slices of veggie pizza and 1 small lemonade for \$5.40.

a. Write a system of equations that goes with this situation. Let  $P$  be the price of the pizza, and let  $L$  be the price of a small lemonade.

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

b. Solve the system using **elimination**.

Slice of Pizza: \_\_\_\_\_ Small Lemonade: \_\_\_\_\_

11. Amy was given an extra credit problem from her math teacher. It read as follows:

"At last night's basketball game they sold two different types of tickets, student tickets and adult tickets. Each student ticket costs \$2 and each adult ticket costs \$5. The door managers brought in \$400 of revenue and sold a total of 140 tickets. How many student tickets for sold?"

In order to help Amy get her extra credit, first write a system of equations. Make sure to identify your variables.

Eq1: \_\_\_\_\_

Eq2: \_\_\_\_\_

So...how many students purchased tickets for the game? \_\_\_\_\_

12. Use what you know about systems of equations to help you solve the following problem:

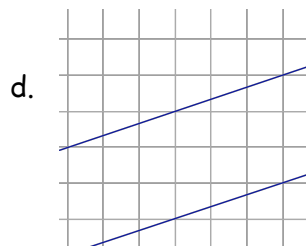
The Math Team is doing a "Wrapping 'Raiser" as a fundraiser for their club. There are two kinds of boxes they're going to wrap, Small and Large. The Math Team is charging \$2.50 for each small box they wrap and \$4.00 for each large box. If they made \$245 and wrapped 70 boxes in all, how many of each type did they wrap?

13. Determine whether each system has ONE solution, NO solution, or INFINITELY MANY solutions. Briefly explain the answer you chose for each one below. Then solve the each system using any method you'd like.

a.  $4x + y = 5$   
 $8x + 2y = 10$

b.  $y = -2x + 1$   
 $y = 8 - 2x$

c.  $x = 3y$   
 $x + 3y = 12$



14. Given the points  $(7, -5)$  and  $(17, 40)$ , find...

a. the **slope** of the segment connecting these two points

b. the **length** of the segment that connects these points

c. the **midpoint** of the segment that connects these points

15. Given quadrilateral ABCD whose sides have the following properties:

Side	Length	Slope
AB	$\sqrt{90}$	$1/3$
BC	$\sqrt{40}$	$-3$
CD	$\sqrt{90}$	$1/3$
AD	$\sqrt{40}$	$-3$

What type of quadrilateral is this? Support your answer with the length and slope information from the table.

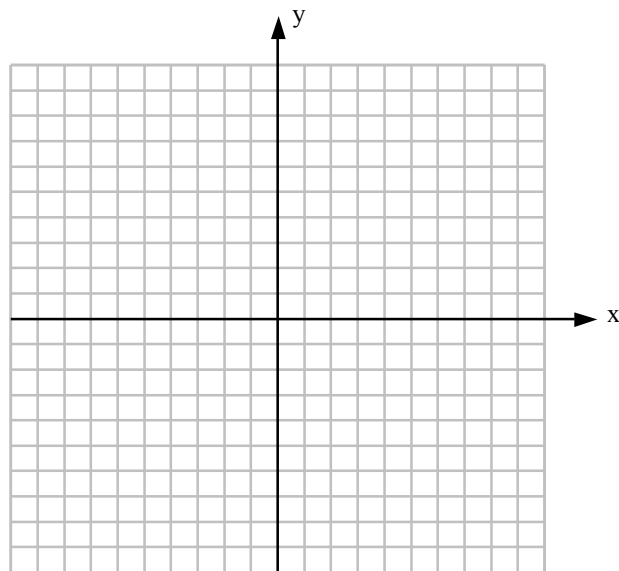
16. Name the three types of **rigid** transformations and explain why they are called “**rigid**” transformations.

17. Use the following coordinate plane.

a. Sketch quadrilateral MATH,  
given the following vertex matrix

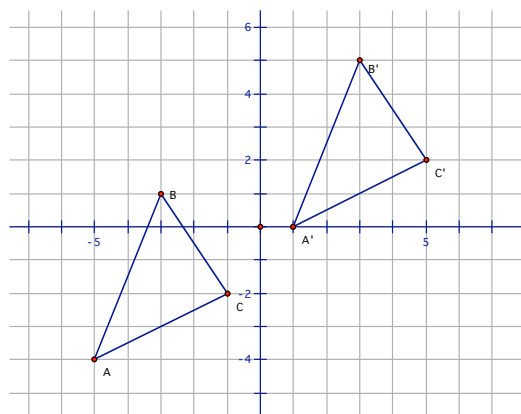
$$\text{MATH} = \begin{bmatrix} -5 & -2 & 4 & 1 \\ -1 & 5 & 2 & -4 \end{bmatrix}$$

b. What type of quadrilateral is MATH?  
Explain your reasoning. You **MUST** show  
all work to support your explanation.



18. **FOR EACH OF THE FOLLOWING:**

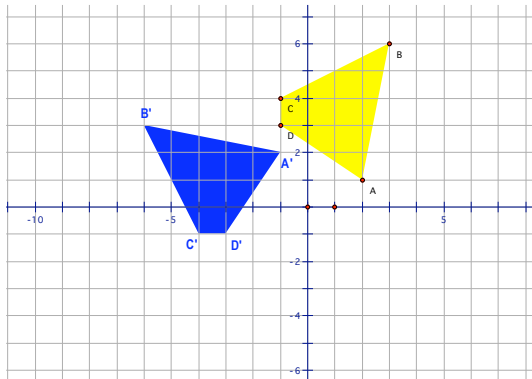
**Describe** the transformation shown below in words (be as **specific as possible**), then state the rule *symbolically*. Be sure to identify which shape is the **PREIMAGE** and which is the **IMAGE**.



Description:

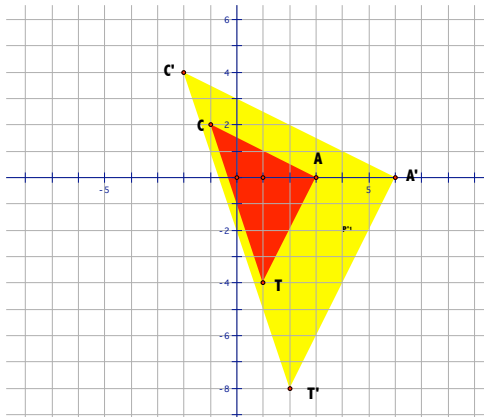
*Symbolic Rule:*  
 $(x, y) \rightarrow ( \quad , \quad )$





Description:

*Symbolic Rule:*  
 $(x, y) \rightarrow ( \quad , \quad )$



Description:

*Symbolic Rule:*  
 $(x, y) \rightarrow ( \quad , \quad )$

19. Quadrilateral DEFG has vertices D(6, 1), E(2, 4), F(4, 7) and G(8, 4).

a. Find the midpoints of sides of the four sides.

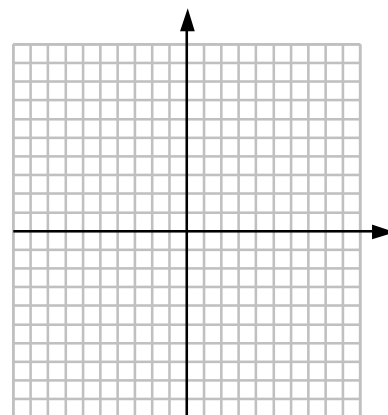
b. Find the coordinates of the image of DEFG under a rotation of  $90^\circ$  counterclockwise, *followed by* a reflection over the  $y=x$  line.

c. Find the coordinates of the image of DEFG under a translation with components 5 and -2, *followed by* a  $180^\circ$  counterclockwise rotation.

20. Consider  $\triangle ABC$  with vertices  $A(-3, 1)$ ,  $B(-7, -2)$ , and  $C(1, -2)$ .

- a. What kind of triangle is  $ABC$ ? Prove it using the slope and distance formulas.

Sides	Slope	Distance
AB		
BC		
CA		



- i. Find the area of triangle  $ABC$ .

- ii. Perform a size transformation by a scale factor of 2 on  $ABC$ , graph the image  $A'B'C'$ , and write the new coordinates.

- iii. Is the area of  $A'B'C'$  going to be **twice** the area of  $ABC$ ? Explain your reasoning.

- b. Write the coordinates of the image of  $ABC$  after a **reflection over the  $y$ -axis**.

- c. Write the coordinates of  $ABC$  after the following transformation:  $(x, y) \rightarrow (x+2, y-3)$

- d. Write the coordinates of  $ABC$  after a **CCW rotation of  $270^\circ$  about the origin**.

21. Simplify the following. All variables must be shown using **POSITIVE EXPONENTS!**

a.  $\frac{3x^4y^3}{3^2xy^3}$       b.  $(3^2m^3n^{-2})(3^3m^4n^5p^4)$       c.  $\sqrt{100r^2t^3}$       d.  $\sqrt[3]{144}$

e.  $8(a^2b^3c^4)^{-3}$       f.  $8(a^2b^3c^4)^3$       g.  $\left(\frac{u^{-2}v^4w^6}{v^{-5}w^2}\right)^5$       h.  $5(d^{-4}e^4f^{-9})^0$

i.  $8^{-1}$       j.  $\left(\frac{2z}{5y}\right)^{-2}$       k.  $2a^2b \cdot 5ab^2$       l.  $(3cd^2)(2c^3d)^2$

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22. Put each expression into *simplest* radical form.

a.  $\sqrt{300}$  → → → → → → b.  $\sqrt{363}$

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c.  $2\sqrt{90}$  → → → → → → d.  $3\sqrt{70}$

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e.  $3\sqrt{72}$  → → → → → → f.  $\sqrt[3]{54}$

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23. **WITHOUT** using a calculator, *estimate* the value of each of the following expressions, AND explain your reasoning.

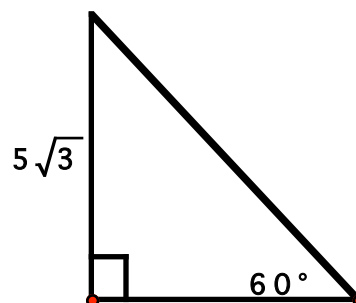
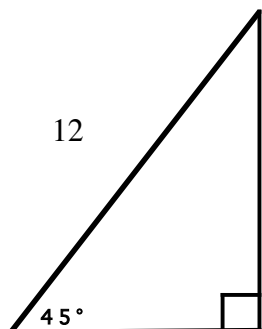
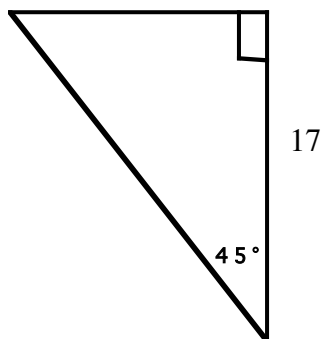
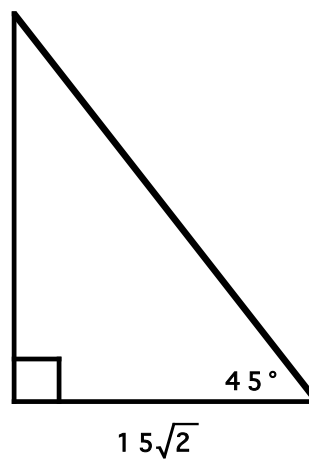
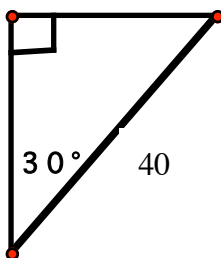
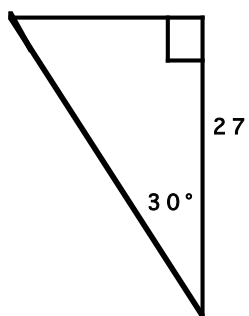
a.  $\sqrt{34} \approx$

b.  $2\sqrt{17} \approx$

c.  $\sqrt{80} + \sqrt{60} \approx$

d.  $\sqrt[3]{20} \approx$

24. Find all missing side lengths. (HINT: You should be able to do this WITHOUT using the Pythagorean Theorem OR your calculator.)



25. An arrow is shot into the air by Chief Talking Bull. The equation describing the height of the arrow (in feet) at any time (in seconds) is:

$$h = -16t^2 + 64t + 5$$

- a. What is the **initial height** of the arrow (including units)? How do you know?
- b. What is the **initial velocity** of the arrow (including units)? How do you know?
- c. Find the height of the arrow after 1.5 seconds. Show or explain how you determined the answer.
- d. At what time(s) will the height of the arrow be 50 feet? 80 feet? Your answer(s) should be correct to the *hundredths* place (two decimal places). Show or explain how you determined the answer.
- e. Find the **maximum height** of the arrow and the **time** it takes to reach this height. Show or explain how you determined the answer.
- f. **How long** will it take for the arrow to reach the ground? Show or explain how you determined the answer.